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Paper Authors

JAWAAD MAAZ KHAN, AKSHAY PRAVEEN DESHPANDE, SREE POOJITHA BETHAPUDI

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MARKET BASKET ANALYSIS USING IMPROVED APRIORI ALGORITHM

[1]JAWAAD MAAZ KHAN, [2]AKSHAY PRAVEEN DESHPANDE, [3]SREE POOJITHA BETHAPUDI
[1,2,3]Data Scientist, at Karvy Analytics Pvt Ltd
[1]jmaazkhan94@gmail.com, [2]akshaydp1995@gmail.com, [3]poojitha.vittala@gmail.com

Abstract
The main objective of mining Data is to transform it into knowledge. This paper explores the basics of data mining with its architecture in brief. It also focuses on the patterns which can be mined so as to convert data in to knowledge. The topic elaborates one of the techniques to analyze the data from large amount of data sets. The analysis explained here is market basket analysis which is basically used by marketer to improve the performance of their business. It can be done by analyzing the available data in such way that frequent item set can be found and can be analyzed to define an association rule. One of the algorithm which helps in finding association rule for frequent item set is Improved Apriori Algorithm for Association Rules. It is explained at the end with a case study in this paper.
Keywords: - Market basket, Improved Apriori Algorithm, Data mining.

1. INTRODUCTION

Data mining also known as Knowledge Discovery in Database (KDD).The purpose of data mining is to abstract interesting knowledge from the large database. From the analysis of abstracted patterns, decision-making process can be done very easily. Association rule is based mainly on discovering frequent item sets. Association's rules are frequently used by retail stores to assist in marketing, advertising, inventory control, predicting faults in telecommunication network. The architecture of data mining system has the following main components data warehouse, database or other repositories of information, a server that fetches the relevant data from repositories based on the user's request, knowledge base is used as guide of search according to defined constraint, data mining engine include set of essential modules, such as characterization, classification, clustering, association, regression and analysis of evolution. Pattern evaluation module that interacts with the modules of data mining to strive towards interested patterns. Finally, graphical user interfaces from through it the user can communicate with the data mining system and allow the user to interact.

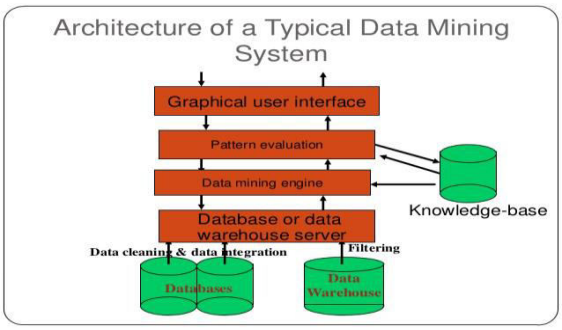

Fig:-1 Architecture of Data mining

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The major components of any data mining system are data source, data warehouse server, data mining engine, pattern evaluation module, graphical user interface and knowledge base.

1. Database, data warehouse, or other information repository: These are the actual information repositories.
2. Database or data warehouse server: Here the data is fetched as per the user's requirement which is need for data mining task.
3. Knowledge base: The collection of discovered data called as knowledge base.
4.Data mining engine :It performs the data mining task such as characterization, association, classification, cluster analysis etc.
5. Pattern evaluation module: It is integrated with the mining module and it helps in searching only the interesting patterns.
6. Graphical user interface: Through this interface communication between user and the data mining system happens and it allows users to browse the data from database or data warehouse schemas.

2. RELATED WORK

Existing algorithm

Classical Apriori algorithms generate large number of candidate's sets if database is large. And due to large number of records in database it results in much more input/output cost. Assumes transaction data base is memory resident. Requires many database scans. Apriori algorithm suffers from some weakness in spite of being clear and simple. The main limitation is costly wasting of time to hold a vast number of candidate sets with much frequent item sets, low minimum support or large item sets. For example, if there are 104 from frequent 1-itemsets, it need to generate more than 107 candidates into 2-length which in turn they will be tested and accumulate [2]. Furthermore, to detect frequent pattern in size 100 (e.g.) v1, v2…v100, it have to generate 2100 candidate item sets [1] that yield on costly and wasting of time of candidate generation. So, it will check for many sets from candidate itemsets, also it will scan database many times repeatedly for finding candidate item sets. Apriori will be very low and inefficiency when memory capacity is limited with large number of transactions.

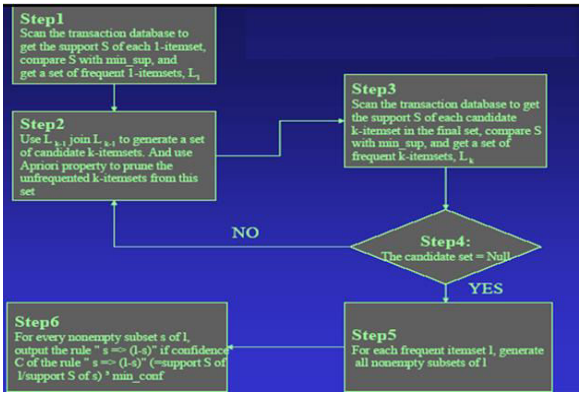

Fig:-2 Flow Chart for Apriori

Proposed System

This section will address the improved Apriori ideas, the improved Apriori, an example of the

improved Apriori, the analysis and evaluation of the improved Apriori and the experiments.

3. IMPLEMENTATION

In the process of Apriori, the following definitions are needed:

Definition 1: Suppose T={T1, T2, … , Tm},(m_1) is a set of transactions, Ti= {I1, I2, … , In},(n_1)is the set of items, and k-itemset = {i1, i2, … , ik},(k_1) is also the set of k items, and k-itemset ⊆

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I.Definition 2: Suppose _ (itemset), is the support count of itemset or the frequency of occurrenceof an itemset in transactions.

Definition 3: Suppose Ck is the candidate itemset of size k, and Lk is the frequent itemset of size
k.

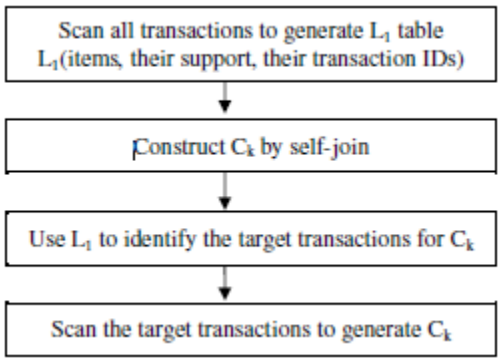


Fig:-3 our proposed approach

In our proposed approach, we enhance the Apriori algorithm to reduce the time consuming for candidates itemset generation. We firstly scan all transactions to generate L1 which contains the items, their support count and Transaction ID where the items are found. And then we use L1 lateras a helper to generate L2, L3 ... Lk. When we want to generate C2, we make a self-join L1 * L1 toconstruct 2-itemset C (x, y), where x and y are the items of C2. Before scanning all transactionrecords to count the support count of each candidate, use L1 to get the transaction IDs of theminimum support count between x and y, and thus scan for C2 only in these specific transactions.The same thing for C3, construct 3-itemset C (x, y, z), where x, y and z are the items of C3 and useL1 to get the transaction IDs of the minimum support count between x, y and z, then scan for C3only in these specific transactions and repeat these steps until no new frequent itemsets areidentified.

The improved Apriori

The improvement of algorithm can be described as follows:

//Generate items, items support, their transaction ID

(1) L1 = find_frequent_1_itemsets (T);

(2) For (k = 2; Lk-1 __; k++) {

//Generate the Ck from the LK-1

(3) Ck = candidates generated from Lk-1;

//get the item Iw with minimum support in Ck using L1, (1_w_k).

(4) x = Get _item_min_sup(Ck, L1);

// get the target transaction IDs that contain item x.

(5) Tgt = get_Transaction_ID(x);

(6) For each transaction t in Tgt Do

(7) Increment the count of all items in Ck that are found in Tgt;

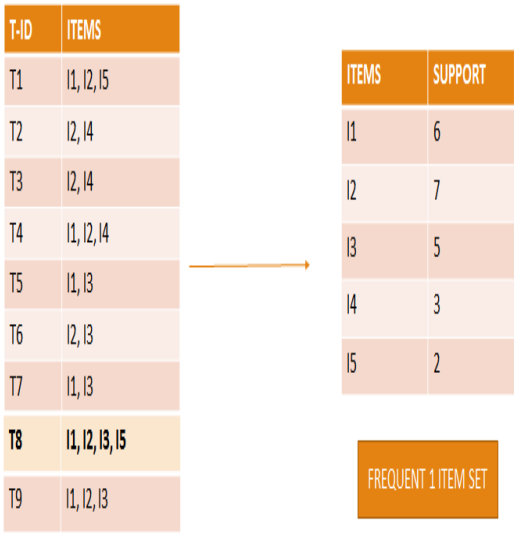
(8) Lk= items in Ck _ min_support;

(9) End;

(10) }

4. EXPERIMENTAL RESULTS

Sample Data of Market basket



T-ID	ITEMS
T1	I1,I2,I5
T2	I2,I4
T3	I2,I4
T4	I1,I2,I4
T5	I1,I3
T6	I2,I3
T7	I1,I3
T8	I1,I2,I3,I5
T9	I1,I2,I3

ITEMS	SUPPORT
I1	6
I2	7
I3	5
I4	3
I5	2

FREQUENT 1 ITEM SET

Fig:-4 suppose we have transaction set D has 9 transactions and the minimum support = 3.The transaction table is

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ITEMSETS	SUPPORT	T-IDS
I1	6	T1, T4, T5, T7, T8, T9
I2	7	T1, T2, T3, T4, T6, T8, T9
I3	5	T5, T6, T7, T8, T9
I4	3	T2, T3, T4
I5	2	T1, T8 (DELETED)

FREQUENT 1 ITEMSET

Fig:-5 Frequent 1 Item Set

ITEMS	SUPPORT	MIN	FOUND IN
I1,I2	4	I1	T1, T4, T5, T7, T8, T9
I1,I3	4	I3	T5, T6, T7, T8, T9
I1,I4	1	I4	T2, T3, T4 (DELETED)
I2,I3	3	I3	T5, T6, T7, T8, T9
I2,I4	3	I4	T2, T3, T4
I3,I4	0	I4	T2, T3, T4 (DELETED)

FREQUENT 2 ITEMSET

ITEMS	SUPPORT	MIN	FOUND IN
I1,I2,I3	2	I3	T5, T6, T7, T8, T9(DELETED)
I1,I2,I4	1	I4	T2, T3, T4(DELETED)
I1,I3,I4	0	I4	T2, T3, T4(DELETED)
I2,I3,I4	0	I4	T2, T3, T4(DELETED)

FREQUENT 3 ITEMSET

Fig:-6 Frequent 2 Item Set, Frequent 3 Item Set

5. CONCLUSION

Market Basket analysis is one of the required analysis and is used in many areas like credit card transactions, for analyzing phone calling patterns, in many of the financial services companies. For this analysis the major process is to find out frequent item sets. Apriori algorithm is the best suitable algorithm to find the frequent item set with heir association rules. An improved Apriori is proposed through reducing the time consumed in transactions scanning for candidate itemsets by reducing the number of transactions to be scanned. Whenever the k of k-itemset increases, the gap between our improved Apriori and the original Apriori increases from view of time consumed, and whenever the value of minimum support increases, the gap between our improved Apriori and the original Apriori decreases from view of time consumed. The time consumed to generate candidate support count in our improved Apriori is less than the time consumed in the original Apriori; our improved Apriori reduces the time consuming by 67.38%

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Lecturer, Department of Information Technology, V.P.M.'s Polytechnic, Thane, Maharashtra, India,International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056Volume: 05 Issue: 04 | Apr-2018

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